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ERRATA IN ARTICLE ON DRIED BANANAS IN AGRICULTURAL CIRCULAR, VOL. 2, NO. 5.

On p. 105, third line after first table for H. M. Cousins read H. H. Cousins.
On p. 105, last line before second table for Leucher read Leuscher.
On p. 105, analysis No. 6 (pulp of green banana) for protein 0·0 read protein 1·0 and for oil 1·1 read oil 0·1.
On p. 106, tenth line for $1{\cdot}3 \times 3{\cdot}9 = 1{\cdot}0$ read $\frac{1{\cdot}3 \times 3{\cdot}9}{5} = 1{\cdot}0$.

REPORT ON EXPERIMENT OF FLY BREEDING FROM STABLE MANURE WITH A SHORT ACCOUNT OF THE FINDING OF A PARASITE.

By A. G. CARMENT, M.D., M.S., B.Sc., D.P.H., Medical Officer of Health and Bacteriologist.

PART I.—PRELIMINARY REPORT.

In view of the fact that now-a-days the common house fly is considered to be a very potent source of danger as a carrier of germs of disease, especially those of cholera, typhoid, and dysentery, what may probably prove to be a most important discovery for Fiji has been made.

It appears that, several years ago, Dr. B. Wilson, who was then stationed at Ba, reported upon the extraordinary disappearance of the veritable pest of house flies that used to prevail in that district, and a similar disappearance was noticed in other parts of the Colony by Doctors Montague and Hunt. Dr. Wilson's report was published in the *Tropical Diseases Bulletin* which is a journal conducted by Dr. Bagshawe, C.M.G., of Uganda fame, and the question was asked as to what might be the cause of the reduction of the fly pest. It went unanswered, however, and it may be that the parasite found now was the cause.

It will be remembered that, at a recent meeting of the Central Board of Health, Mr. Lees, the Commissioner of Works, complained of the number of flies which troubled householders in the Domain; he thought that they were probably due to a manure dump at the Chinaman's garden close by. I at once commenced an experiment to ascertain where the pests were bred, and am still busy upon it. For this purpose I took a fair sample of the manure from Robinson & Ballantyne's stables and placed it at the back of the laboratory, where it was put under a mosquito net cover in order that the flies might breed out. When this has happened it is intended to spray the flies with some stain, so that they will be distinctively coloured, and then to liberate them at the Chinese garden, at the same time asking

residents in that locality to put out fly papers; it will then be possible to ascertain if the flies actually do travel from the garden to the surrounding houses, or whether the flies complained of are, to a large extent, bred around the houses themselves. In experimenting with this manure I discovered that the flies were not breeding out in anything like the large quantities I expected from such a bed. I therefore took off a top layer from the manure to ascertain if the house fly pupæ were as common on top as they were below, as it was generally considered that they would not be. In assisting with this experiment, the Government Entomologist discovered the presence in the manure of a tiny wasp-like insect, about one-third the size of a house fly, which he considered might be a parasite thereto. Closer observation in the laboratory of small parts of the manure disclosed the fact that these small, wasp-like things were moving about inside the pupal cases of the flies, and about twenty of these little insects have been bred out of the fly pupal cases, demonstrating clearly that they are parasites to that pest. It was observed that, whereas the fly, being provided with a bladder-like head protection, bursts the top off the pupal case and thus makes its exit, the little wasp eats its way out of the side of the case. It is presumed that the wasp lays its eggs inside the pupal cases, but I am now busily observing this welcome little insect in an endeavour to ascertain where in the history of the house fly the parasite first makes its appearance. It is, of course, highly probable that this same little insect has been responsible for the great reduction in the number of flies that has been noticed in many parts of the Colony, and it would also make it appear as if the Chinaman's manure heap is perhaps a very important factor in the elimination of the fly pest rather than a powerful factor in its multiplication.

Part II.

It will be remembered that, about a week ago, I reported the finding of a parasite which appeared to be at work amongst common house flies. It was shown that the parasite took the form of a small wasp-like insect, about one-third the size of the house fly. Investigation disclosed that a number of these insects were moving about inside the pupal cases of the flies. It was also observed that the little wasp ate its way out of the side of the case, and it was presumed that the wasp laid its eggs inside the pupal cases of the fly. But of the life history of the wasp little was known then. Now, however, more is known of its habits.

I closely studied the matter for the last week, and have bred out a number of the wasps. These have been placed in an experimental chamber containing fresh manure, in which lay the larvæ of flies, almost fully developed. It was then noticed that the wasps did not attack the larvæ, but seemed determined to probe well into the patches of manure. On the manure drying, it was found the wasps became most active, and travelled rapidly through the interstices of the manure. Eventually it was discovered that the wasps were in search of the fly pupæ. The wasp is furnished with an ovipositor—a spear-like appendage—by means of which it is able to pierce the shell of the pupæ; so that it is in this manner that the wasp attacks the fly. At a suitable moment, the wasp, having selected a pupa for the purpose, pierces the shell with its ovipositor, and deposits its eggs on the inside of the pupal case.

An examination of three pupæ taken from the manure heap showed, on dissection, minute maggots, and presumably this is a stage in the life history of the wasp. They were feeding on the soft tissues of the developing fly until they themselves, in their turn, became fully developed and were able

to burst through the shell of the fly pupæ and take wing, leaving behind the pupal shell with vestiges of the fly.

Further investigations are now being carried out by me to prove the contention that the wasp-like insect is indeed a true parasite of the common house fly. But there seems little doubt that the experiment so far has given us a knowledge of the full life history of the tiny wasps. Efforts are at present being made to breed out mature wasps from the specimens now on hand.

It is presumed that, when this is done, the young wasps will be liberated in those areas where the house fly is a real pest, and it is fully anticipated that results will show that the little wasp is a most aggressive insect and that its work lies particularly with the common house fly. If this be so, we shall have good cause to congratulate ourselves.

This investigation was carried out in two separate experiments, viz.:—

(*a*) To breed out flies so as to mark a large number to be liberated.

(*b*) To breed out the parasitic hymenopterous insect, to work out its life history.

(*a*) Fly Breeding Experiment.

Following up my preliminary reports, I continued my experiment by obtaining a sample of manure from Robinson & Ballantyne's stables on 4th February, 1922, in which there was a large number of fly larvæ. This was put in a wide glass receptacle and covered with brown paper, to darken the experiment, and a circular hole was cut in the centre on top for flies to emerge. Over this was placed a glass chimney, also to some extent darkened, and the upper end of the chimney entered a large white mosquito net cage. The whole experiment was suspended in the open air so as to prevent ants attacking and destroying the flies in the various stages of their development. The first flies bred out on 16th February, but the bulk of them on the morning of 5th March. In the net cage sugar water was placed in a glass petri dish and lint, wet with sugar water, was applied in the surface on the top of the net cage. In small experiments it had been found that, if the imagos were not supplied with fluid, they died within a day of emerging (water alone kept them alive).

Having bred out well over 1,500 flies, I next attempted to mark them for identification, because these flies were to be liberated in a certain Chinaman's garden in the Domain, Suva Town, as this garden received manure from Robinson & Ballantyne's stables, and was believed to be the cause of the prevalence of flies in the European houses surrounding this vegetable garden, the distances of these dwellings ranging from 100 yards to a quarter of a mile, as the fly flies.

Spraying with ½ per cent. fuchsin watery solution was tried, and although the flies were marked on the wings with this, I considered the method uncertain, for if the weather was wet the faint pink colouration might be discharged or turned to a light brown colour; besides, some of the flies might escape even careful spraying. A small experiment in a test tube of feeding flies on sugar dissolved in ¼ per cent. solution of fuchsin, showed that, although the fly evacuations were coloured at first and much of the fuchsin was thus got rid of, yet, in a day's time, the abdominal contents took on the pink stain, which was shown to be permanent by putting the flies into clean tubes afterwards, and feeding them on ordinary sugar and water, the abdomens retaining the stain and giving the appearance as if fresh blood had been ingested. The stain did not interfere with the health of the flies.

Flies were then put on a two course diet of scraps of meat covered with a ¼ per cent. solution of fuchsin, and also bread and sugar similarly coloured, and the lint on the top of the cage was constantly moistened with the coloured sugar solution.

After five days of this varied and nourishing diet it was found that the flies were well coloured and from time to time, they were also sprayed with the weak fuchsin solution.

Not more than half a dozen flies died during the experiment, and many had been living on this food for over a week. On the 9th of March (the fifth day) the flies were liberated at the manure heap and other parts in the Chinaman's garden. The day was bright, and a fair breeze blowing from the south. Residents in the vicinity were asked personally to put out clean fly traps and fly papers after a public notice had been given in the local press.

On the 10th March all reported plenty of flies caught, but none coloured. However, on examining fly paper taken from the kitchen of the nearest house (100 yards circa.), I found two pink flies, the colouring being obscured by the brown sticky material of the fly paper.

On the 11th the traps of soap and water in a house (400–500 yards circa.) away, and on the windward side, caught many of the coloured flies, and others were actually caught in the same house one week after. From this it would appear that flies travel against the wind, evidently following a scent, as no flies were reported to the leeward, the prevailing wind at this season blowing from the South or South East.

This breeding experiment proved conclusively, to my mind, that the parasitic wasp does not attack the larvæ of the flies breeding out in stable manure, but only the pupal stage, and any period of this stage before the fly is fully formed, as observed in other experiments.

(*b*) Rearing of a Hymenopterous Insect (Polistes. sp.) found to be a Parasite on Fly Pupæ.

On the 11th February, 1922, a number of these insects, bred out from manure collected from Robinson & Ballantyne's stables (see preliminary report), were placed in a glass chamber containing manure with nearly fully developed fly larvæ. On the 16th some of the pupæ which had formed from these larvæ were examined for the presence of larval forms of this parasite, and they were present; in fact, one was actually bred out as a typical wasp on a microscope slide, after the removal of the muscid pupal case in which it was developing the wasp pupa formed a diaphanous pupal case for itself on the slide, and emerged from this on the 3rd of March, 1922, and, assuming that the fly larvæ became pupæ on the 13th of February and the ovipositing of this parasite took place on that date, then the period of development from egg to imago of the parasite would be 18 days. This coincided fairly accurately with the rest of the parasites breeding out. The parasitism in this small experiment was total, no fly emerging. I have not been able to observe the egg of the parsite, but have found the larva in a very early stage of its life. It is, in fact, a typical wasp larva, being broad in the middle and tapering to the ends; it consists of 14 segments, 10 of which have pairs of tubercles placed laterally, the larva is translucent white, and has a dark yellowish grey alimentary sac (there is no anus) observable through the body wall; this latter being composed of round cells full of fatty droplets, and is enveloped in a thin cuticle. The buccal cavity is supported by an oval chitinous frame-work, with two lateral sup-

ports, and is armed with two lateral teeth. There is a constant peristaltic wave movement through the whole body, which may originate from either end, and is probably the circulation of lymph.

It would appear that the egg is deposited on the fly pupa within the pupal case, and, so far as observed, near the head end of the developing fly pupa, *i.e.*, at the opposite end from the spiracles. Adult parasites bred out were male and female, the former being almost twice as large as the latter; the gauzy wings of the female almost entirely covering the abdomen. Evidently the female can give rise to a new brood parthenogenetically, as one bred out under cover was observed to apparently oviposite an egg on another fly pupa without any food or copulation (it being alone), and from the pupal case a living parasite larva was obtained. When the parasitic wasps were liberated on manure containing fly larvæ, along with which a watery solution of cane sugar was placed, they were never seen to feed on this, but as soon as the manure showed signs of drying the parasites wandered through the interstices of the mass, with a view to ovipositing.

The ease with which the laboratory propagation of this insect was carried out is a matter of some importance, and points the way to its rapid spread, and a hope of a total destruction of flies breeding from stable manure.

Suva, 21st March, 1922.

THE HOT SPRINGS AT NASAVUSAVU.

By C. Harold Wright, M.A., F.I.C., Government Chemist.

The hot springs at Nasavusavu seem to have undergone considerable changes in historic times. The earliest description of these hot springs is in *Narrative of the United States Exploring Expedition*, Vol. III, Philadelphia, 1845, pp. 196–8, by Charles Wilkes, Commander of the Expedition, who visited them in 1840. There were then five hot springs. " These springs are used by the natives to boil their food, which is done by putting the taro or yams into the springs, and covering them up with leaves and grass Although the water scarcely had any appearance of boiling before, rapid ebullition ensues. It gurgles up to a height of eight or ten inches with the same noise as is made by a cauldron when over the fire." The next description is by Miss C. F. Gordon Cumming, who was at Nasavusavu in August, 1876, and in *At Home in Fiji*, 2nd edition, 1881, Vol. II, p. 76, states that there are three principal springs, which " bubble up in a circle like a small crater. They are intermittent, and the highest makes a fountain about two or three feet high." Dr. H. B. Guppy, F.R.S., *Observations of a Naturalist in the Pacific*, London, 1903, Vol. II, p. 27, states that " according to the description of Kleinschmidt they were in the same intermittent condition in May of the same year. There were then four springs situated in a bowl-shaped hollow. The two larger springs were not constantly bubbling up, but displayed periodic ebullitions of about twenty minutes' duration, the waters disappearing in the intervals." John Horne, who was at Nasavusavu in 1878, in *A Year in Fiji*, London, 1881, p. 163, refers to " the principal boiling springs, three or four in number " and states that " the water in these boils up to a height of about a foot with a gurgling sound." Dr. Guppy, *loc. cit.*, states that about this time the springs assumed the form of geysers. From information collected by him from old residents in the neighbourhood it appears that " the waters spouted up to a height of from 40 to 60 feet, not vertically but at an angle. Each outburst, which

lasted for ten or twenty minutes, was followed by an interval of repose, during which the springs dried up. This continued for a month or two, after which the springs gradually resumed their normal level." When Dr. Guppy visited the springs in July and November, 1898, " they were boiling briskly, attaining a height of a few inches, and showed no signs of intermittent action."

When I was at Nasavusavu in September, 1921, there were three springs. In two of them the water was boiling briskly attaining a height of about one foot, but in the spring in the centre the temperature was 79° C. (174·2° F.). A thermometer held by means of a long stick in the centre of the largest spring stood at 100° C. (212° F.), the boiling point of water. This is of some interest because Charles Wilkes and Dr. Guppy did not measure a temperature higher then 210° F.

A sample of water was obtained by me from the largest of the three hot springs. The water was collected with an enamelled iron pan, and after cooling was poured into a stoppered bottle brought from Suva for the purpose. This water was found to contain in parts per 100,000:—silica, 15·7; lime, 248·4 (= calcium, 177·5); magnesia, 0·7 (= magnesium, 0·4); soda, 175·1 (= sodium, 129·9); potash, 23·1 (= potassium, 19·2); chlorine, 496·0; sulphuric anhydride, 20·2; total solids dried at 120° C., 871·9. The composition of this water may therefore be stated as follows:—

Sodium silicate	31·9
Calcium sulphate	34·3
Calcium chloride	463·8
Magnesium chloride	1·7
Sodium chloride	299·7
Potassium chloride	36·6
Difference	3·9
Total	871·9

The water from the hot springs at Nasavusavu has been analysed four times previously and the analyses are given by Dr. Guppy in *Observations of a Naturalist in the Pacific*, Vol. II, pp. 28 and 29. These analyses do not agree very well among themselves, and it was in the hopes of trying to reconcile some of these differences that I took the sample of water for analysis. A sample of water from the hot springs was obtained in 1840 by the United States Exploring Expedition; but at this time methods of chemical analysis were somewhat imperfect, hence it is not surprising that this analysis does not agree with the others. In 1876 a sample of the water was obtained by Kleinschmidt, which was analysed by Dr. Oscar Pieper of Hamburg. He found that the water was neutral in reaction and contained 8·48 parts of total solids per 1,000 (*i.e.*, 848 per 100,000), 4·79 parts of chlorine per 1,000 (*i.e.*, 479 per 100,000), and 2·31 parts of lime per 1,000 (*i.e.*, 231 per 100,000), together with sulphuric acid, silicic acid and potash. These results agree very closely with mine. We differ as to the presence of iron: Dr. Pieper found the presence of iron in the water and states that after long standing hydrated iron oxide separated out; I on the other hand found the water absolutely free from iron in the ferrous and ferric states by testing comparatively large quantities of the sample. The next sample was obtained by H. Stonehewer Cooper in 1877 or 1878 and was analysed by H. Rocholl, who found the water to contain in parts per 100,000:—calcium sulphate, 26·0; calcium chloride, 435·5; magnesium chloride, 2·1; potassium chloride, 41·5; sodium chloride, 264·1. These results agree very closely with Dr.

Pieper's and mine, and show that, though the water from the hot springs differs slightly in composition, yet it retains the same general characteristics.

The fourth analysis was made by Dr. A. Liversidge, F.R.S., formerly Professor of Chemistry in Sydney University, with a sample obtained by Dr. Brownlow, of H.M.S. *Sapphire* in 1879. The results differ considerably from those obtained by Dr. Pieper, Mr. Rocholl and myself. In addition to the constituents found by all of us Dr. Liversidge found in the water iron and aluminium and traces of phosphoric and carbonic acids. I have explained above that the sample of water I took was entirely free from iron; it was also free from aluminium, phosphoric acid and carbonic acid. When the original sample without dilution is made alkaline with ammonia, there is formed a white precipitate, which is calcium hydroxide, and not aluminium hydroxide. When, however, the original sample is diluted with an equal volume of water and made alkaline with ammonia, it remains perfectly clear, even after standing; this proves the absence of aluminium, and also phosphoric acid, since the water contains calcium. The absence of phosphoric acid was also proved by testing the water with ammonium molybdate. In analysing the water the dissolved solids after being dried in the hot air oven were dissolved in water and treated with hydrochloride acid, and in no case were there any signs of effervescence—thus showing the absence of carbonates.

We may thus conclude from the above analyses that the water from the hot springs at Nasavusavu contains 871·9 parts of dissolved solids per 100,000, which is equal to 610·3 grains per gallon; and that these dissolved solids consist chiefly of the chlorides of calcium and sodium, with smaller quantities of potassium chloride and calcium sulphate and a still smaller quantity of magnesium chloride, associated with silicic acid (probably as sodium silicate); and that it has maintained this general composition since 1876.

A LEAF DESTROYING MOTH OF COCONUTS IN FIJI, AGONOXENA ARGAULA (MEYR).

By H W. Simmonds, F.E.S., Acting Government Entomologist.

This moth described by Meyrich (*Exotic Microlepidoptera* Vol. II, p. 472), in November, 1921, is a common pest of coconuts throughout the whole of Fiji, where the damage it does must have an appreciable effect upon the yield of nuts.

The moth is about three-eighths of an inch long, of a pale yellowish brown colour when the wings are closed, with a line of silvery white along the inner margin of the wings from base to tornus, and a similar whitish patch near the extremity of the wings, from the tornus to the costa. The under wings are whitish ochreous. The moth has a habit of lying along the midrib of the leaflets of the coconut palm during the daytime, and its peculiar flattened appearance is probably connected with this habit.

It must not be confused with the coconut leaf destroying moth *Levuana iridescens*, which is of a beautiful deep purple colour, and is confined to Vitilevu, and flies in bright sunshine.

Life History.

The egg has not yet been discovered but is probably laid singly, and not as in *Levuana* in batches.

Larva.

The young larva is very pale yellowish, and very thin in proportion to its length, and feeds under a loose web, which it spins on the underside

of the leaves. As it grows larger it becomes greenish in tint and is very active. The lines of brown on the leaf caused by the larva eating away the green portion underneath and leaving the thin colourless epidermis, which subsequently turns brown, can be distinguished from similar ones made by *Levuana*, by their usually shorter length, and also by their occurring spasmodically over the leaf, and not as in *Levuana* almost totally destroying the green material.

When full grown the larva is about seven-eighth inch long, pale green, with a light brown head and first two segments, and the eighth segment also is pale yellowish brown.

Pupal Stage.

The larva when fully fed spins a cocoon either along one of the ribs of the coconut leaflet, or more frequently drops to the ground, and there spins it upon a blade of grass, or along the midrib of one of the low plants which grow under coconut trees.

The cocoon is dull white with a peculiar thickening of the strands of which it is composed in the centre, so that it gives the appearance that there is a spider lying extended underneath its web. Doubtless this is to protect it against its enemies which are numerous. The pupal stage lasts about ten (10) days.

Natural Enemies.

In May, 1921, I bred out a large number of these moths from larvæ and pupæ found on Vanualevu; exactly half were found to produce parasites instead of the moth. There were two parasites present. One a small wasp (a Chalcid) about 4 mm. long, black with reddish legs, was very common; 35 out of the 37 parasites produced proving to belong to this species. The other also a wasp, but of a very different shape (a Braconid), with a long narrow body was also black, but had yellowish legs. I only obtained two specimens of this, and it is quite possible that it is really parasitic upon the Chalcid and not upon the moth.

These enemies apart from the work of birds, lizards, &c., quickly bring the moth under control, except in certain places such as our insectorium, where the moth breeds freely; but the parasites have so far failed to appear. The moth was also very bad on certain trees at Lautoka and it is possible that the smoke from the mill has a more harmful effect upon the parasites than upon the moth itself.

NOTICES.

CLIDEMIA HIRTA.

Clidemia hirta (Koster's Curse or Kaurasiga) is an introduced weed which has spread over very large areas of the provinces of Rewa, Naitasiri, Tailevu, Colo East, and Colo North. It covers considerable tracts of open land on the banks of the Rewa River and its tributaries. If not checked, it quickly takes possession of land thrown out of cultivation or laid under grass. The fruit of this weed is a small purple berry, which contains about 500 seeds. These berries are eaten by mynahs and other fruit eating birds. Hence its spread can be checked by preventing the formation of seed by up-rooting it or cutting it down before or during the flowering stage.

It is the duty of all persons seeing this weed on land previously free from it to root it up and effectively destroy it Only by vigorous and combined

action on the part of all residents in localities where this weed has recently made its appearance can its spread be prevented. All persons who observe this weed on land previously free from it are requested to inform the Superintendent of Agriculture; and anyone who is not familiar with this weed will be supplied with a dried specimen of the leaves on application to the Superintendent of Agriculture.

The Noogoora Burr Ordinance was passed in 1919 to deal with Noogoora Burr (*Xanthium strumarium*). Section 18 of this Ordinance was amended by the Noogoora Burr Amendment Ordinance 1920, section 2 of which provides that it shall be lawful for the Governor in Council on a resolution in that behalf being passed by the Legislative Council to extend the provisions of that Ordinance to any plant, shrub, or tree. On 17th November, 1920, a resolution was passed by the Legislative Council that the provisions of the Noogoora Burr Ordinance should be extended to the plant *Clidemia hirta* in certain parts of the Colony, namely:—

(*a*) the provinces of Ra and Colo North in the island of Vitilevu;

(*b*) the districts of Muaira, Nagonenicolo, and Nailega in the province of Colo East, and the districts of Nayavu and Dawasamu in the province of Tailevu in the island of Vitilevu;

(*c*) all other islands in the Colony with the following exceptions:—

(1) the island of Taveuni and such islands as lie within three miles of its coast;

(2) such islands, not being within the province of Ra, as lie within three miles of the coast of Vitilevu.

An Order in Council made under section 3 of the principal Ordinance prescribes the following steps to be taken by occupiers of land within the parts of the Colony mentioned above for the eradication of *Clidemia hirta*:—

If the plant has not seeded, it must be up-rooted and exposed to the sun, having been removed from contact with the soil. If the plant has seeded it must be up-rooted and destroyed by fire. (See *Royal Gazette*, No. 6 of 1921.)

It will thus be understood that all the provisions of the Noogoora Burr Ordinance 1919 apply *mutatis mutandis* to *Clidemia hirta* in the parts of the Colony mentioned above, and the following sections of this Ordinance should be particularly noted.

Section 6 provides that it shall be the duty of the occupier of any land on which this weed exists to destroy it in the manner prescribed in the Order.

Section 8 provides that an Inspector may at all reasonable times enter upon such land for the purpose of ascertaining if the prescribed steps are being taken or if this weed exists thereon.

Section 9 provides that if the occupier of the land does not take the prescribed steps an Inspector may by notice request him to comply with them by doing the necessary work within a period prescribed in the notice, and it shall be the duty of the occupier so to do.

Section 10 provides that if the occupier fails or neglects to comply with such notice the Inspector may enter upon the said land and do the work at the expense of the occupier.

Section 11 provides for the expenses incurred by a lessee or tenant in carrying out the steps prescribed by the Order.

Section 12 provides that in the case of native lands in the occupation of natives it shall be the duty of the Buli of the district in which the lands are situated to do all things for the purpose of carrying out the steps in the Order prescribed and all natives of the district refusing without reasonable excuse to obey shall be liable on summary conviction to a fine of two pounds or three weeks imprisonment.

In any case of default in carrying out the prescribed steps the notice provided by section 9 shall be given to the Buli of the district.

In the event of an Inspector doing the work on any such land the amount of expenses incurred shall be paid by the native owners of such land and shall be a first charge on any moneys payable to such native owners whether by rent or otherwise coming into the hands of the Government.

Section 15 provides that every person commits an offence against this Ordinance who (1) fails to take the steps prescribed by the Order; (2) obstructs or hinders the Inspector in the exercise of any power or function conferred on him by this Ordinance.

Section 16 provides that every person committing an offence against this Ordinance shall be liable on summary conviction to a penalty not exceeding £20 and in case of a continuing offence to a further penalty not exceeding £5 for each day during which the offence continues.

BUD-ROT IN COCONUT PALMS.

It is hereby notified for general information that, in accordance with Regulation 14 of the Regulations made by the Governor under section 6 of the Diseases of Plants Ordinance 1913, His Excellency defines the following area in which the disease of coconuts known as Bud-rot exists:—The Colony of Fiji. (See *Royal Gazette*, No. 3 of 1922, p. 13.)

It is also notified that His Excellency the Acting Governor declares that the Regulations made by the Governor in Council on 29th November, 1913, in pursuance of section 6 of the Diseases of Plants Ordinance 1913, shall apply to the following disease:—Bud-rot in coconut palms. And that in accordance with Regulation 20*a* made by the Governor in Council on 30th November, 1921, His Excellency the Acting Governor orders that coconut palms affected with such disease shall be destroyed and disposed of by the said Regulation. (See *Royal Gazette*, No. 3 of 1922, p. 13.)

Regulation 20*a* referred to above is as follows:—

"Notwithstanding anything contained in Regulations 17 to 20 inclusive "of these Regulations, the Governor may, if he shall think fit, at the time "he declares any disease in accordance with Regulation 13 of these Regu- "lations, order that trees or plants affected with such disease shall be "immediately destroyed and disposed of in such manner as shall be "directed by the Superintendent of Agriculture or by an Inspector autho- "rised in writing by him for that purpose and if such directions are not "immediately carried out by the owner of such trees or plants, such "trees or plants may be destroyed forthwith by such Inspector at the "expense of the owner and disposed of in such manner as such Inspector "shall think fit." (See *Royal Gazette*, No. 69 of 1921, p. 336.)

Bud-rot is a disease of coconut palms characterised by the complete rotting of the terminal bud and the surrounding soft tissues, which then becomes a brown slimy mass with a putrid odour. The external appearances of the disease are the yellowing and drooping of the leaves and the falling of the immature nuts. Generally the first signs of the disease are the drooping and discolouration of the unopened upright leaf in the centre of the crown. The disease may kill a tree very quickly if the first point of attack is near the bud itself, but when the outer leaves are the first attacked the tree may live for some time. In both cases the final result is the same, namely, the complete rotting of the terminal bud, which results in the death of the tree.

Bud-rot is probably caused by bacteria. When the disease is first noticed the bud is usually so badly decayed that there is no possibility of saving the tree. Trees suffering from bud-rot should therefore be immediately cut down and destroyed, and all infected material burnt or buried to prevent the spread of the disease.

All owners and occupiers of land who observe signs of bud-rot on their land are requested to immediately inform the Superintendent of Agriculture, who as soon as possible after the receipt of such information will send an Inspector of Plantations to their land.

PRICE OF PADDY.

The Rice Mill Board is prepared to buy from 1st April, 1922, paddy in any quantity, not less than one sack, weighing not less than 1½ cwt., at rates not exceeding £9 per ton for table variety (Motka), and £8 per ton for other varieties (namely, Patna, Chaitwa or Gazee, Karia, Laldhan and Baramasia) of first class paddy, *i.e.*, sound, matured, and winnowed grain. Delivery will be taken at certain centres in each district, and freight from those centres will be paid by the Board, who will also supply bags.

PROCLAMATION.

A Proclamation, No. 1 of 1922, forbidding the importation of cattle from the State of Victoria until 31st December, 1922, owing to an epidemic of pneumonia there, was published in the *Royal Gazette*, No. 6 of 1922, p. 26.

Another Proclamation, No. 3 of 1922, is published in the *Royal Gazette*, No. 8 of 1922, p. 33. In this Proclamation the importation of all seeds, live-stems, and whole plants of pasture grasses and fodder grasses is prohibited except under a written permit from the Superintendent of Agriculture. This prohibition does not apply to the seeds, live-stems, and whole plants of *Panicum barbinode* (Para grass), *Panicum maximum* (Guinea grass), and *Paspalum* species.

IMPORTATION OF HIDES AND SKINS INTO THE COMMONWEALTH OF AUSTRALIA.

The attention of exporters of hides and skins to the Commonwealth of Australia is drawn to the following extract from Regulations made under the Australian Quarantine Act:—

* * * * * * * * * * * * *

1. The owner or consignor shall forward with any hide or skin a declaration made in the country of origin before a magistrate to the effect that to the best of his knowledge and belief such hide or skin was not derived from any animal which had suffered from or died from anthrax or similar disease, and that it has been effectively dry-salted, wet-salted, or arsenically dressed.

2. The consignment shall be accompanied by a certificate from a Government officer of the country of origin to the effect that—

(1) to the best of his knowledge the declaration is true and correct; or

(2) that after microscopical and biological examination of the hides or skins and examination of any doubtful hides or skins, he is satisfied that they are free from disease.

* * * * * * * * * * * * *

WEEDS AS PESTS AND THEIR SUPPRESSION.

That weeds prove injurious in more than one direction has become common knowledge, and the necessity for their suppression is realised.

Previously it was thought that weeds were of little importance as specific pests to agriculture and to the stockman (using these words in the broadest sense), as was also the case in regard to navigation. Practical experience, however, has proved this notion to be wrong. To-day, all parties interested should be on the lookout and guard against the introduction and spread of weeds, for it has become quite evident that the losses accruing from rank weed growth can be, in many instances, if not greater, just as great as those brought about by insects, fungi, and other agents.

In spite of these facts, however, very often there is a tendency to neglect a weed on its first appearance, until its spread has become alarming. It is thought that this arises from the fact that the work of weeds is less visible than that of insects, &c., and therefore is more difficult of demonstration; that the presence of vegetation is inevitable, and the line of demarcation between noxious weeds and wild plants is indistinct; and that new weeds are not recognised until their spread becomes severe, and any means of checking them costly or impractical. An excellent illustration of such a tendency is given in the *Monthly Bulletin of the Department of Agriculture*, California, October-November, 1920, in the spread of the Russian thistle in that State. It is stated that when first observed in the Antelope Valley, where it had already occupied a large area, vigorous action, followed by persistent watchfulness to avoid new infestations, might have freed the State of this pest; but in spite of warnings from various authoritative sources, the weed was allowed to spread until now it covers the southern half of California, and a large area of the northern part.

Weeds are injurious to agriculture from the points of view of robbing the soil of moisture and plant food; of over-crowding crops and increasing the cost of operation; and of reducing the final values of crops. A good example of these was given in an article published in the *Agricultural News* for April 17, 1920, dealing with an experiment conducted in Hawaii with regard to weed control and fertilisation. It was shown that the application of fertilisers without weed control, as compared with weed control and no fertilisers, produced no greater gains; weed growth and no fertiliser proved very deleterious as compared to weed control and no fertilisers.

To the stockman great losses have accrued by the rapid spread of weeds. His grazing lands gradually deteriorate under the growth of plants of inferior forage value. The vitality of animals feeding on unnutritious foods is gradually lowered. This lowering in vitality may be so slight that the ill effects may not be observed until it is too late. On the other hand, stock may be killed outright by eating poisonous weeds. In the case of sheep, very often the market value of their wool is lowered, owing to the presence of burs, for instance.

With regard to weeds proving a pest to navigation, the reader is referred to an article published in an earlier issue of this Journal (January 22, 1921), on the water hyacinth (*Eichornia crassipes*), which it is stated, has become a serious menance to navigation in the rivers of Florida. It has become so abundant in Florida, Louisiana, and Texas as to obstruct navigation in the waters emptying into the Gulf of Mexico. Attempts to eradicate this pest have cost the United States Government millions of dollars, but it would appear that, so far, no thoroughly effective method has been discovered which will completely remove the weed at a reasonable cost. Not

only, however, has this pest interfered with navigation, but it is said to have caused great loss in the value of timber floated down the St. John's River. In such instances, the rank decaying vegetation also becomes a menace to sanitation, forming a shelter and breeding place for insect pests, as well as interfering with sewage disposal.

As already mentioned, the necessity for weed suppression is quite apparent. There should be thorough co-operation among all those affected in order to prevent the introduction of new weed pests and to guard against the spread of such as are already established.—*The Agricultural News*, Vol. XX, No. 492, p. 67.

METEOROLOGICAL OBSERVATIONS.

Date.	January.			February.		
	Temperature.		Rain.	Temperature.		Rain.
	Max.	Min.		Max.	Min.	
1	85·4	69·0	..	90·4	73·4	..
2	86·2	72·0	..	90·0	74·0	·10
3	86·8	72·6	·40	88·2	75·0	·21
4	87·0	73·0	·25	87·2	72·0	·48
5	84·8	73·4	·95	88·0	72·8	..
6	84·0	70·6	3·20	89·6	73·4	..
7	83·4	73·6	3·26	90·0	73·8	..
8	82·6	68·0	·30	90·4	73·4	·40
9	83·2	70·0	..	90·2	74·0	..
10	84·4	69·4	..	89·8	72·0	..
11	85·0	70·6	..	90·2	72·6	·30
12	84·6	71·0	..	90·0	72·0	..
13	85·4	70·4	..	88·4	73·6	·40
14	84·0	71·2	·62	88·0	73·0	·70
15	85·6	69·0	1·35	88·6	72·6	·66
16	85·0	73·2	·40	86·4	73·0	·50
17	86·0	72·6	..	87·2	72·4	·50
18	85·6	73·0	2·25	86·4	70·0	·72
19	87·0	72·8	1·85	84·6	69·0	1·20
20	86·8	73·4	·30	84·0	71·8	6·20
21	86·2	74·0	..	84·4	71·4	·45
22	87·4	71·2	..	85·0	71·0	1·00
23	88·0	72·0	..	84·8	71·2	·20
24	90·4	72·8	2·30	86·0	72·0	1·94
25	90·0	74·2	..	87·2	71·2	·16
26	91·0	74·8	..	86·0	71·0	..
27	90·6	75·2	..	86·8	72·0	..
28	90·8	75·0	3·72	88·0	72·2	..
29	90·0	71·5	2·75	..	..	..
30	90·6	72·2	1·25	..	..	..
31	91·0	73·0	..	..	..	..
	..	..	25·15	..	..	16·12

Agricultural Associations in Fiji.

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